URI Watershed Watch: Monitoring Rhode Island's Waters

Elizabeth Herron
Program Coordinator
URI Watershed Watch
University of Rhode Island - Natural Resources Science
URI Cooperative Extension

THE UNIVERSITY OF RHODE ISLAND COOPERATIVE EXTENSION

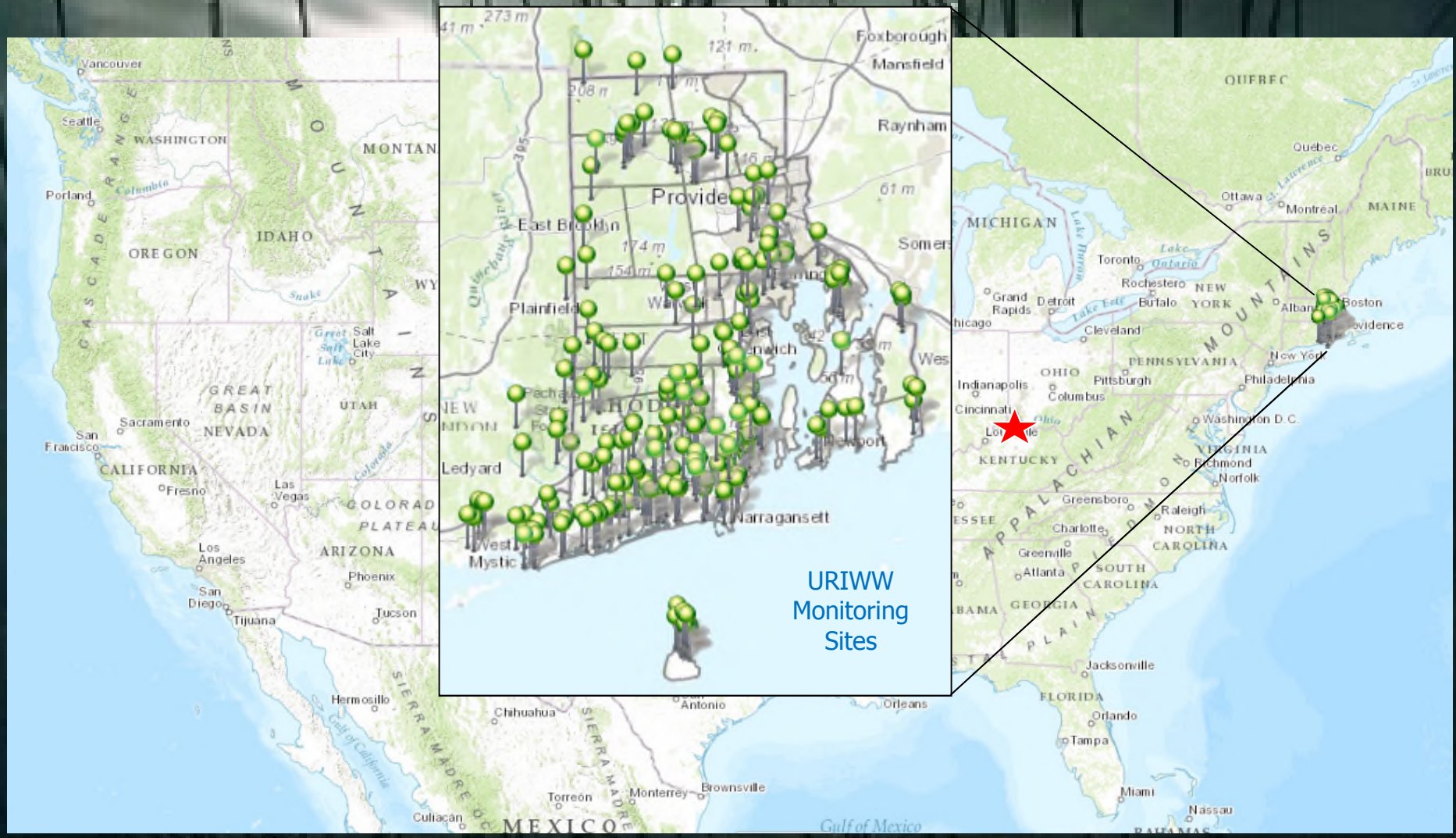
THINK BIG WE DO℠

100 Years of COOPERATIVE EXTENSION 1914 - 2014

Presentation Overview

- Brief introduction to URIWW
- VERY brief data overview
- Examples of how our data are used
- Questions

Rhode Island



URI Watershed Watch (URIWW)

- Began in 1988 with 14 lakes
- Now has volunteer monitors on 250+ sites on 180+ waterbodies
  - Lakes, ponds & reservoirs
  - Rivers, streams & tributaries
  - Salt ponds, surfing sites, etc….
- Provides ~90% of RI's lake baseline data

Long term ecological monitoring

www.uri.edu/ce/wq/ww

We have Wonderful Volunteers!

350+ active volunteer monitors

- **all 14 major watersheds**
- **most RI communities**
- **several CT towns**

>1000 Monitoring Families

Methods and Tools

- Volunteers use well established monitoring methods (i.e. Standard Methods) adapted to the resources, facilities and needs of our programs,
- Use dissolved oxygen kits, thermometers and refractometers rather than meters,
- Small state means volunteers can transport samples to our laboratory within standard holding time and we can interact

Credible Data

- State-certified laboratory
- Methods and tools have been rigorously tested:
  - Side by side comparisons
  - Samples split with certified labs
  - Program has been evaluated
- We have approved QAPPs
  - QAPPs and manuals posted online
  - **www.uri.edu/ce/wq/ww/**
- Data used extensively: RIDEM, USEPA, others

QAPPs

- Worked with RIDEM and USEPA to streamline the QAPP process
- Created “generic” lab and field QAPPs
- Develop project specific QAPPs as needed
- Allows us to respond to local needs more efficiently – while adhering QAPP

URIWW Parameters

Field

- Secchi Depth
- Water Temperature
- Dissolved Oxygen
- Chl. - a Processing

Laboratory

- pH
- Alkalinity
- Total & Dissolved Phosphorus
- Total, nitrate and ammonium nitrogen
- Chlorophyll - a
- Chlorides
- Bacteria

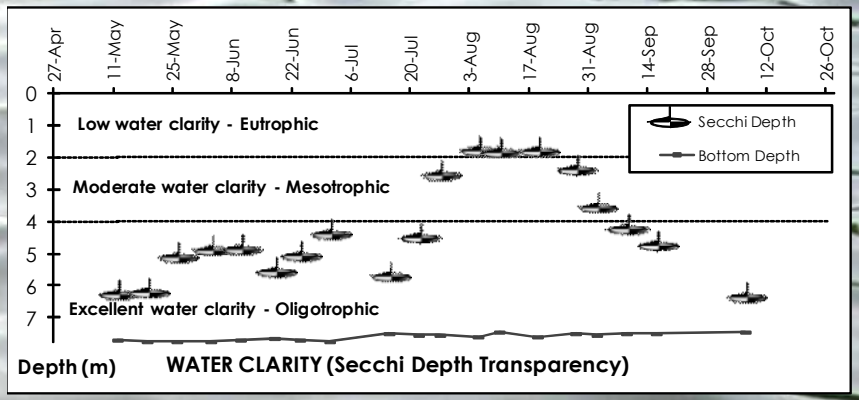
Way too much information and too complex to summarize easily

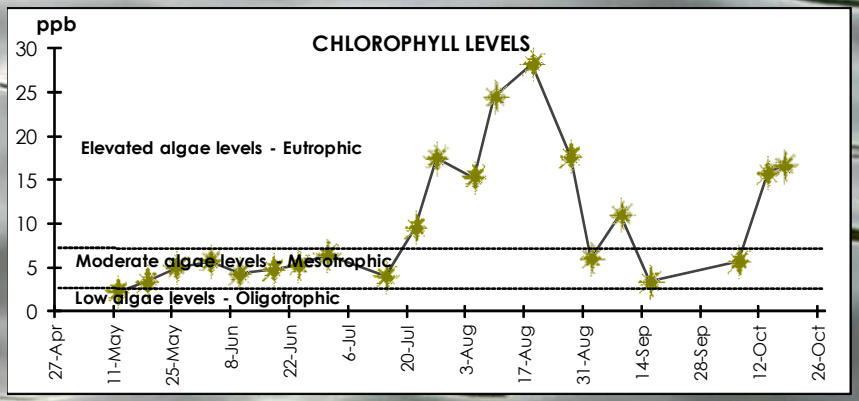
Bacteria

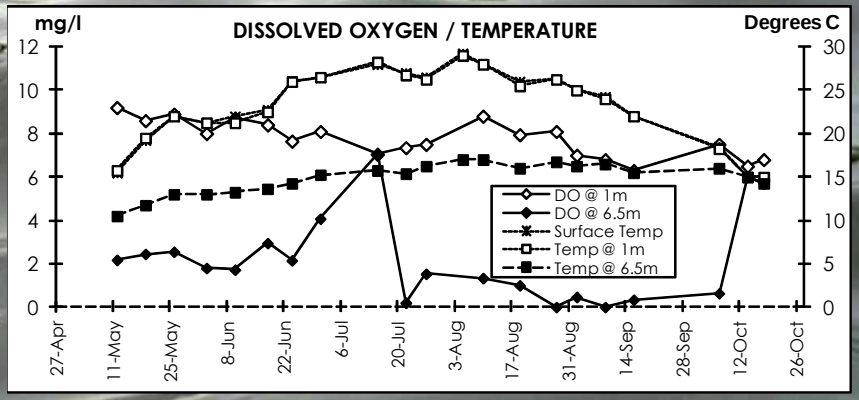
- Swimming areas generally good
- Rainfall increases bacteria levels beyond acceptable ranges
- Rural and urban watersheds

Watershed code	MONITORING LOCATION	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	GEOMEAN
		----	Most Probable Number of Enterococci per 100 mL					----
A	Annaquatucket - Belleville @ RR Xing	232.4	165.8	150	60	274.8	84.4	141.6
NA	Buckeye Brook #1 @ Novelty Rd	82	6970	487	284	146	132	339.3
NA	Buckeye Brook #2 @ Lockwood Brk	185	857	1632.8	775	583	96	473.2
NA	Buckeye Brook #3 @ Warner Brook	170	3640	60	-	-	-	333.6
NA	Buckeye Brook #4 @ Mill Cove	-	6240	4155	498	435	-	1539.3
WD	Falls River D - Step Stone	22	31.2	285.1	66	59.8	69.7	61.4
WD	Falls River C - Austin Farm	14.8	68.3	144.5	118	117.9	30.6	63.0
WD	Falls River B - Sand Banks	29.2	75.4	200.5	201	95.9	22.2	75.7
WD	Falls River A - Twin Bridges	19.6	109.1	94.5	101	98.7	15	55.8
GB	GB #2 - Burger King	31	>2419.6	157.2	3106	399	17329	>795
GB	GB #3 - Pipe @ Rte 115	62	>2419.6	80.4	27	41	19863	>253
GB	GB #4 - Mill Creek	52	>401	448	394	272	1091	>320
GB	GB #5 - Hardig Upstream	63	3465.8	258.6	345	288	8664	604.1
GB	GB #6 - Tuscatucket Br	20.8	194.8	96.4	<2	30	47.2	21.9
GB	GB #7 - Southern Creek	132	1511.2	813	192	187	9804	620.4
A	Himes River	4	147.6	278.8	48.6	73.6	1918	102.0
H	HW #1A - Scrabbletown Brk @ Falls	12.6	83.1	251.8	120.4	186	1553	144.7
H	HW #1B - Scrabbletown @ Rte 4 Bridge	16.8	118.4	90.4	59	90	19865	163.3
H	HW #5 - Sandhill Brook (Saw Mill Inlet)	62	201.4	471.8	333	112	2005	275.8
H	HW #6 - Hunt River @ Forge Rd.	85	123.6	90.4	63	81	75	84.4
TH	Moosup Upstream	20	1445	100	551	1317	>24196	>608
TH	Moosup A - Fairbanks Bridge	40.2	1445	112.6	48	144.6	19863	310.4
TH	Moosup C - Deerfield Drive	21.8	885	91.4	51	76.6	7701	193.7
WD	Pawcatuck River @ Bradford	21.6	54.8	114.6	16.4	21.6	79.8	39.6
PA	Pawtuxet River - near Rhodes	97	840	94	43.6	10	32	68.9
WD	Queen River @ Locke Brk	6.2	-	40.6	-	-	-	15.9
WD	Queen River @ Sherman Brk	<2	118.4	1454	215.2	143.4	-	63.9
WD	Shickasheen Brook @ Rte 2	135.4	DRY	DRY	26.8	48.4	4839	170.7
WD	Shickasheen @ Miskiania Road	11.9	22.2	437.4	167.8	-	10	45.8
WD	Shickasheen @ Barber Pond Outlet	109.1	4.2	3.1	8.7	25.3	<2	6.3
WD	Shickasheen Brook @ Rte 138	74.6	200.5	176	50	258	31	101
WD	Shickasheen Brook @ Liberty Lane	43.2	47.8	215.4	64.6	96.4	73	76.6
WD	White Horn Brook @ Bike Trail	52	28.8	305	32.4	30	53.9	53.7
WD	White Horn Brook @ Ministerial Rd.	31	42.9	556	84.5	31	98.5	75.9
WO	Woonasquatucket R. @ Greystone Pnd	86	380	305	15	62	857	141
WO	Woonasquatucket River @ Donigian	161	429	520	54.4	231	>9678	>404
WO	Woonasquatucket River @ Waterplace	30	697	6488	161.8	216	19863	675
GB	GrBay #6 - Ponaug Marina	120	486	41	226	99	551	176
GB	GrBay #13 - EG Town Dock	42	<10	30	10	30	124	19
WD	Pawcatuck River - North of WWTP	111	64	42	<10	-	<10	23
WD	Pawcatuck River - South of WWTP	99	20	<10	10	-	20	13
WD	Pawcatuck River - At the Mouth	64	<10	<10	<10	-	344	<10
SK	Sapowet Marsh #1	>2005	327	345	171	-	10	>208
SK	Sapowet Marsh #2	>2005	52	<10	10	-	88	>39
SK	Sapowet Tributary #1	-	-	2489	-	-	-	-
SK	Sapowet Tributary #2	-	-	5475	3130	-	-	4140
NA	Wickford Cove - West of Loop Dr	<10	10	127	Lab error	20	406	25
NA	Wickford Cove - East of Loop Dr	<10	10	99	Lab error	10	124	17

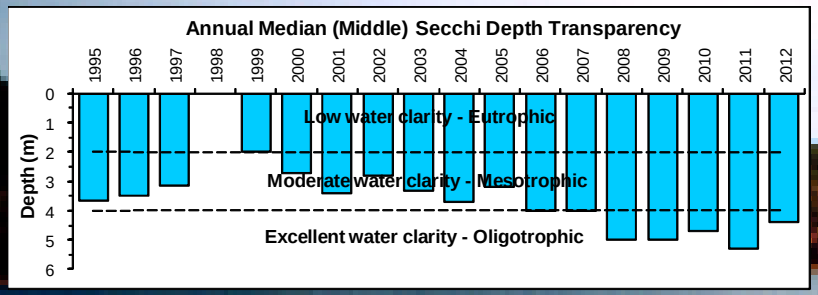
Annual Monitoring Data

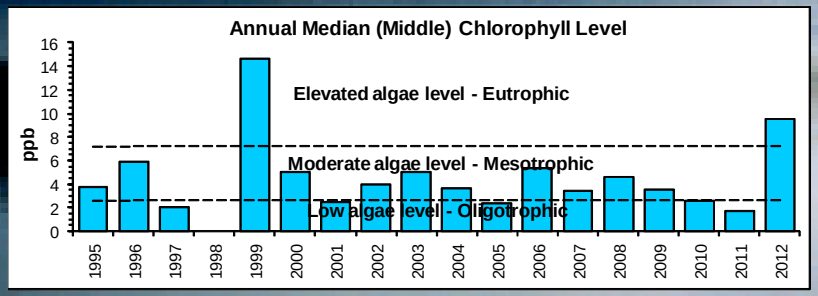


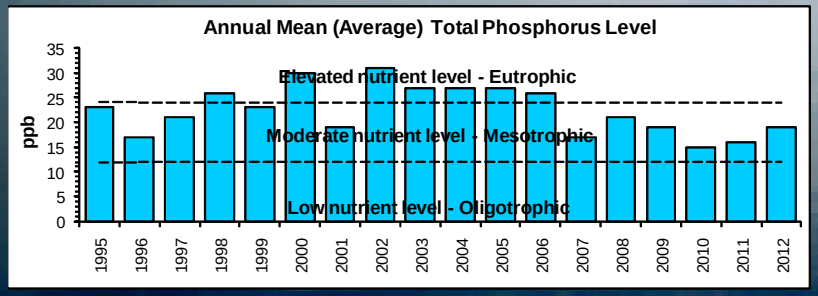


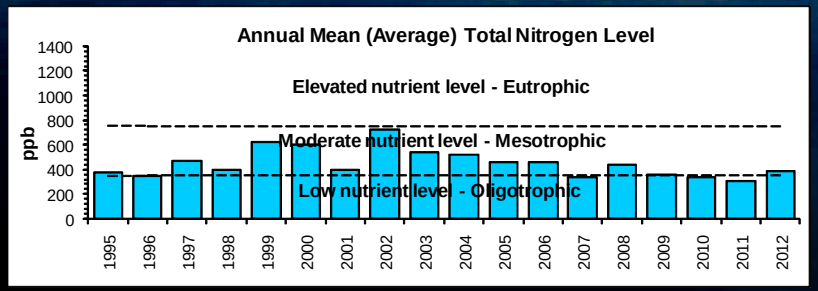


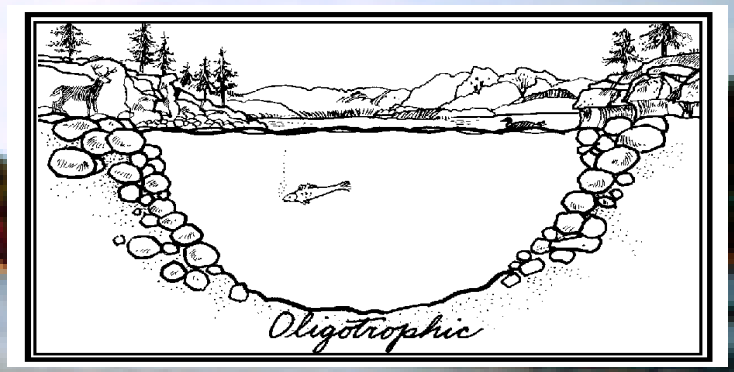
Multi-Year Trophic State

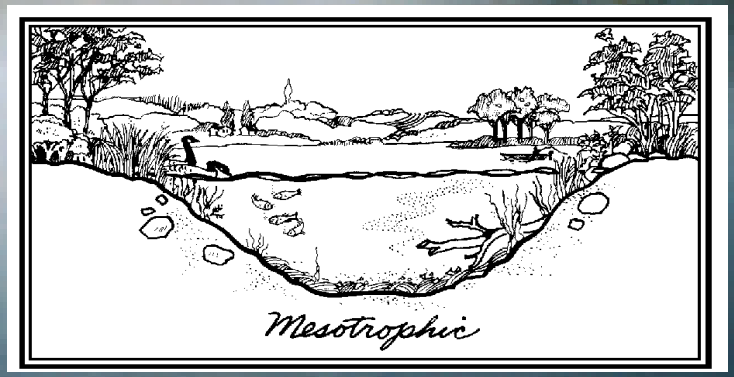


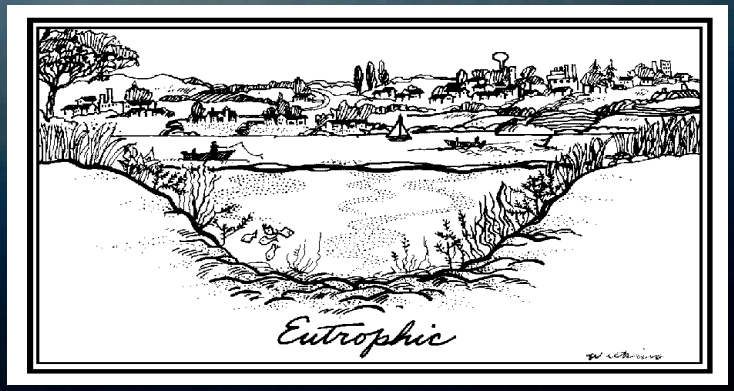




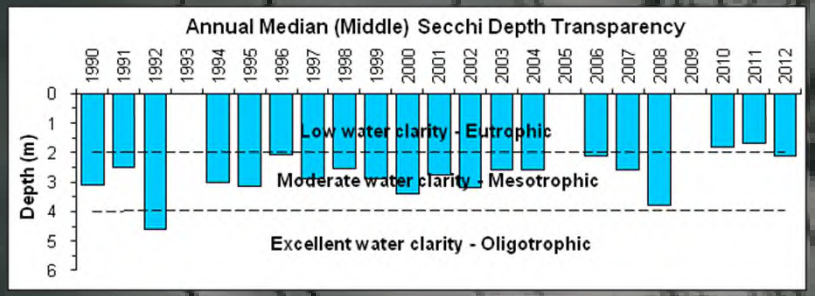


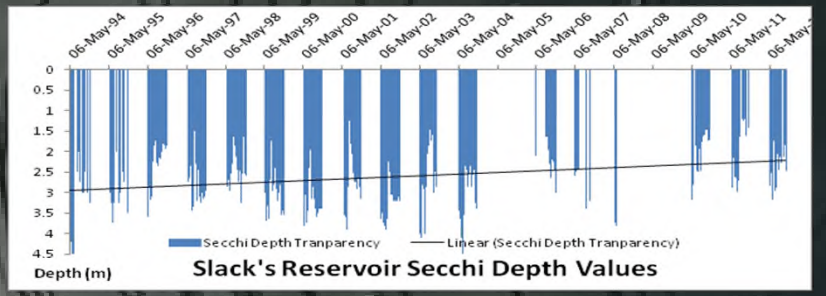


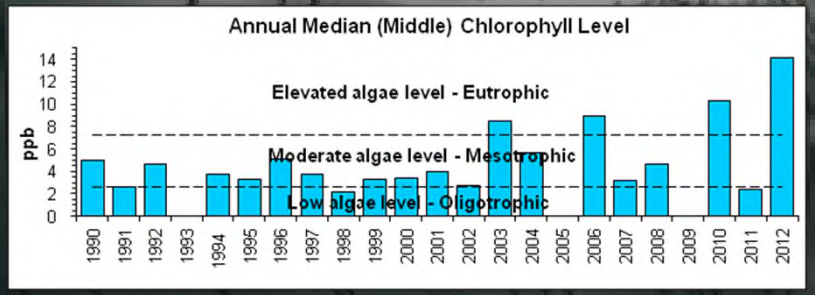


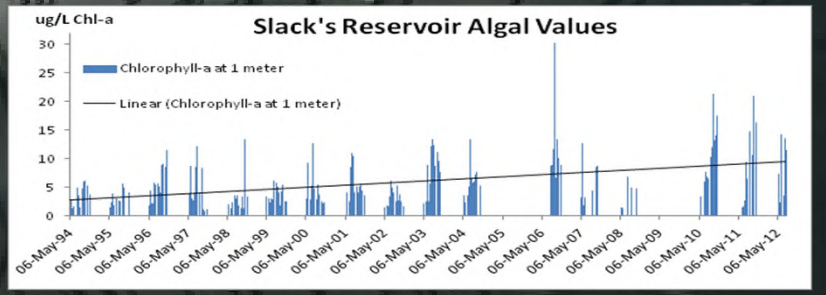


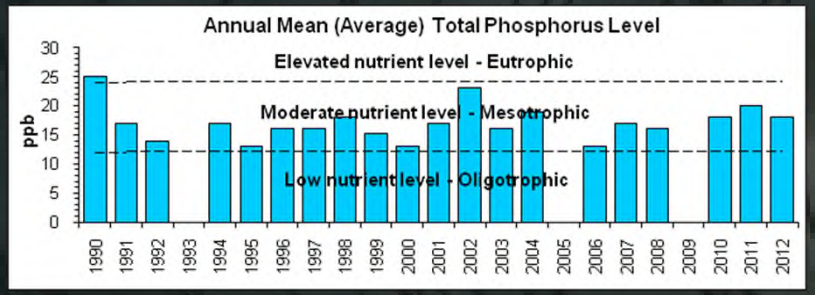
Multi-year

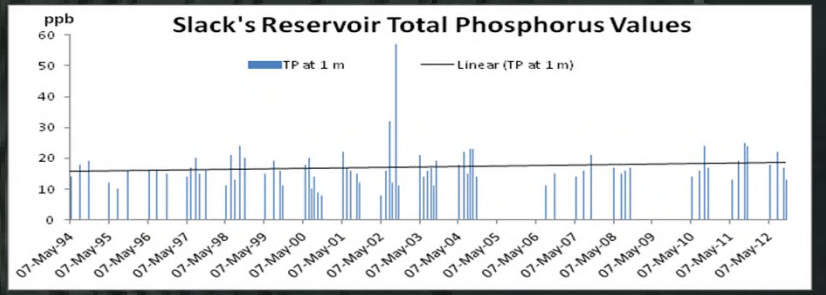

Annual Median (Middle) Secchi Depth Transparency
Depth (m)
Low water clarity - Eutrophic
Moderate water clarity - Mesotrophic
Excellent water clarity - Oligotrophic

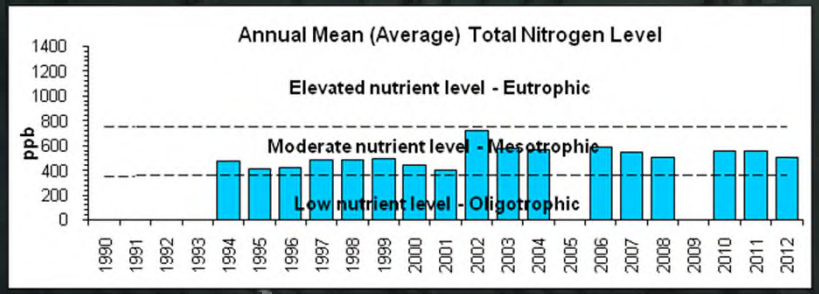

Secchi Depth Tranparency
Linear (Secchi Depth Tranparency)
Depth (m)
Slack's Reservoir Secchi Depth Values

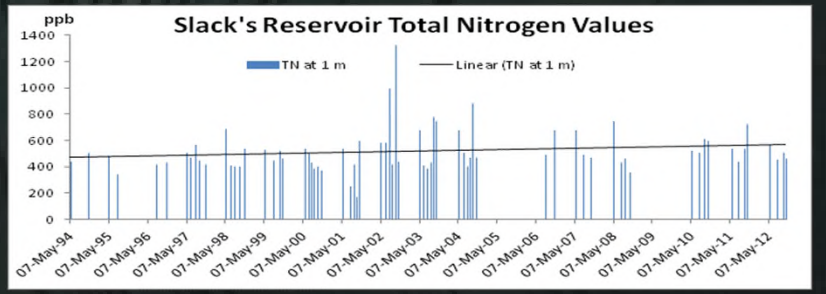

Annual Median (Middle) Chlorophyll Level
ppb
Elevated algae level - Eutrophic
Moderate algae level - Mesotrophic
Low algae level - Oligotrophic


ug/L Chl-a
Slack's Reservoir Algal Values
Chlorophyll-a at 1 meter
Linear (Chlorophyll-a at 1 meter)

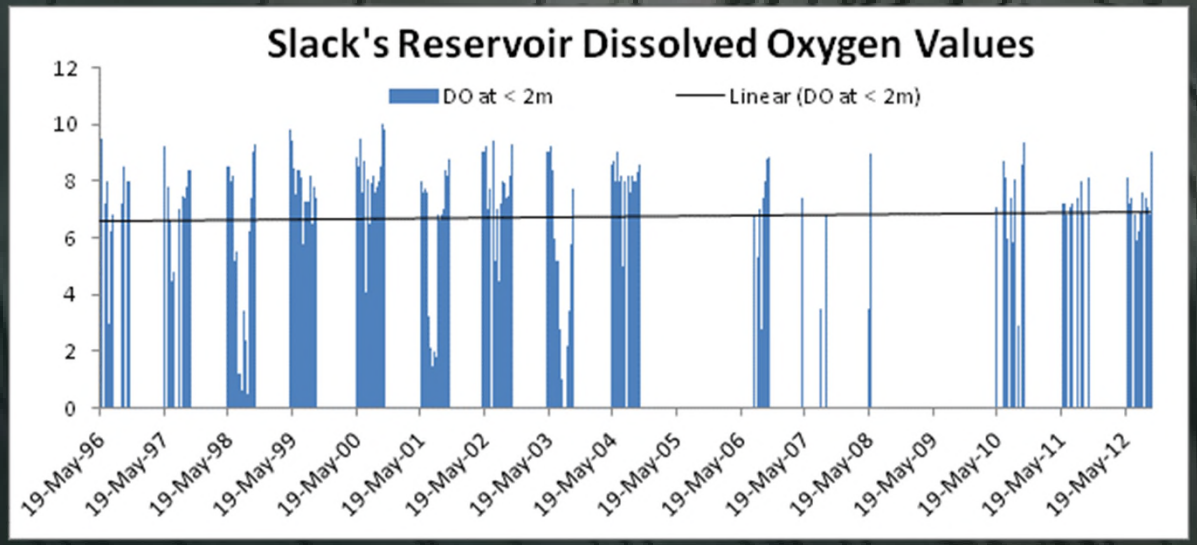

Annual Mean (Average) Total Phosphorus Level
ppb
Elevated nutrient level - Eutrophic
Moderate nutrient level - Mesotrophic
Low nutrient level - Oligotrophic

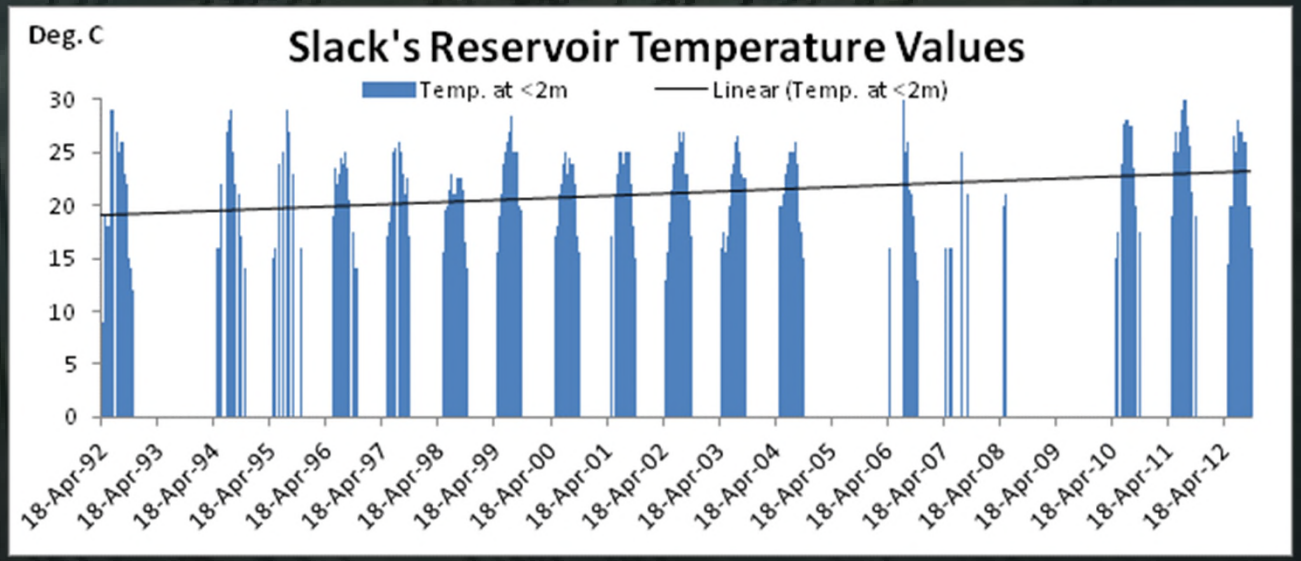

ppb
Slack's Reservoir Total Phosphorus Values
TP at 1 m
Linear (TP at 1 m)


Annual Mean (Average) Total Nitrogen Level
ppb
Elevated nutrient level - Eutrophic
Moderate nutrient level - Mesotrophic
Low nutrient level - Oligotrophic


ppb
Slack's Reservoir Total Nitrogen Values
TN at 1 m
Linear (TN at 1 m)

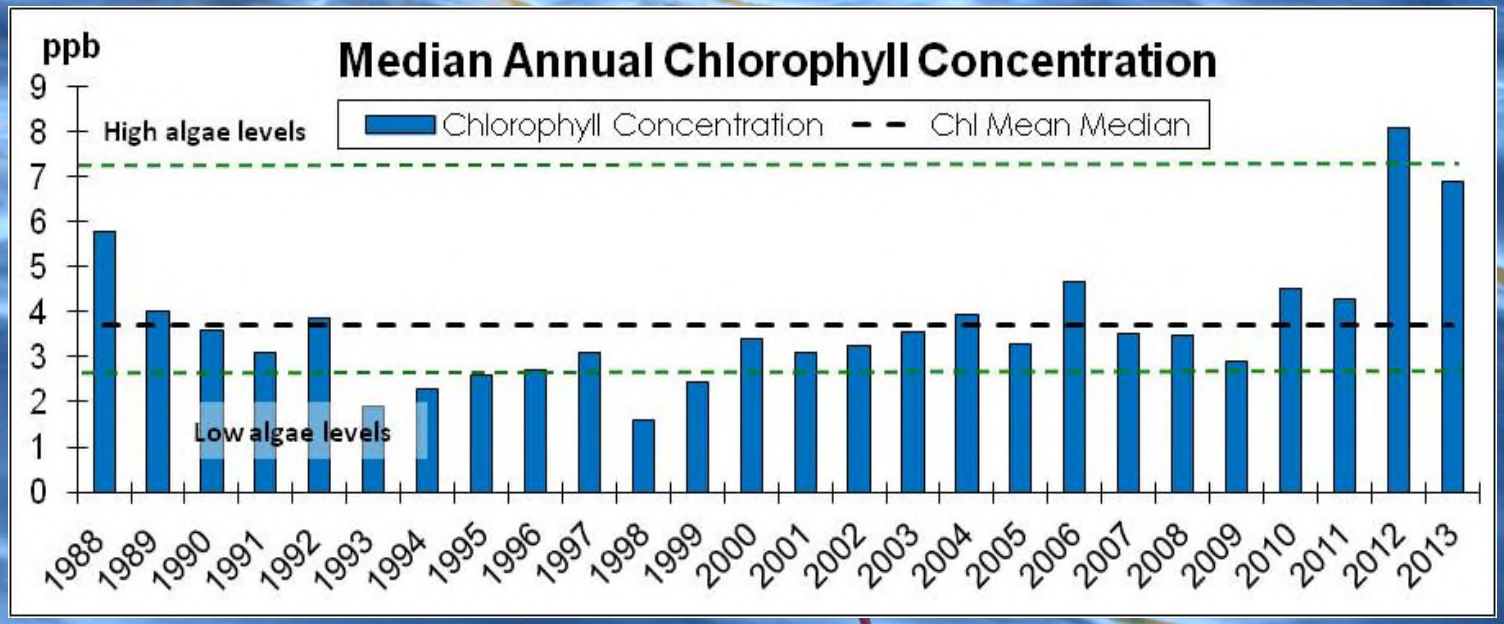
Other Long Term Data

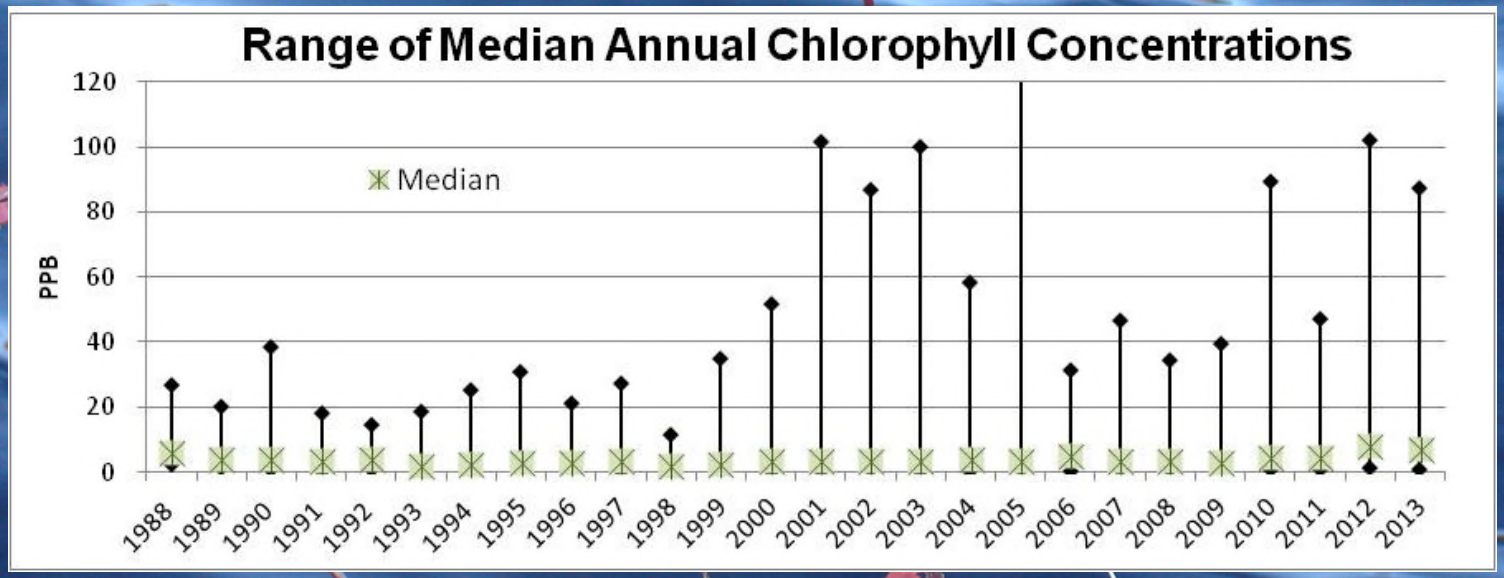




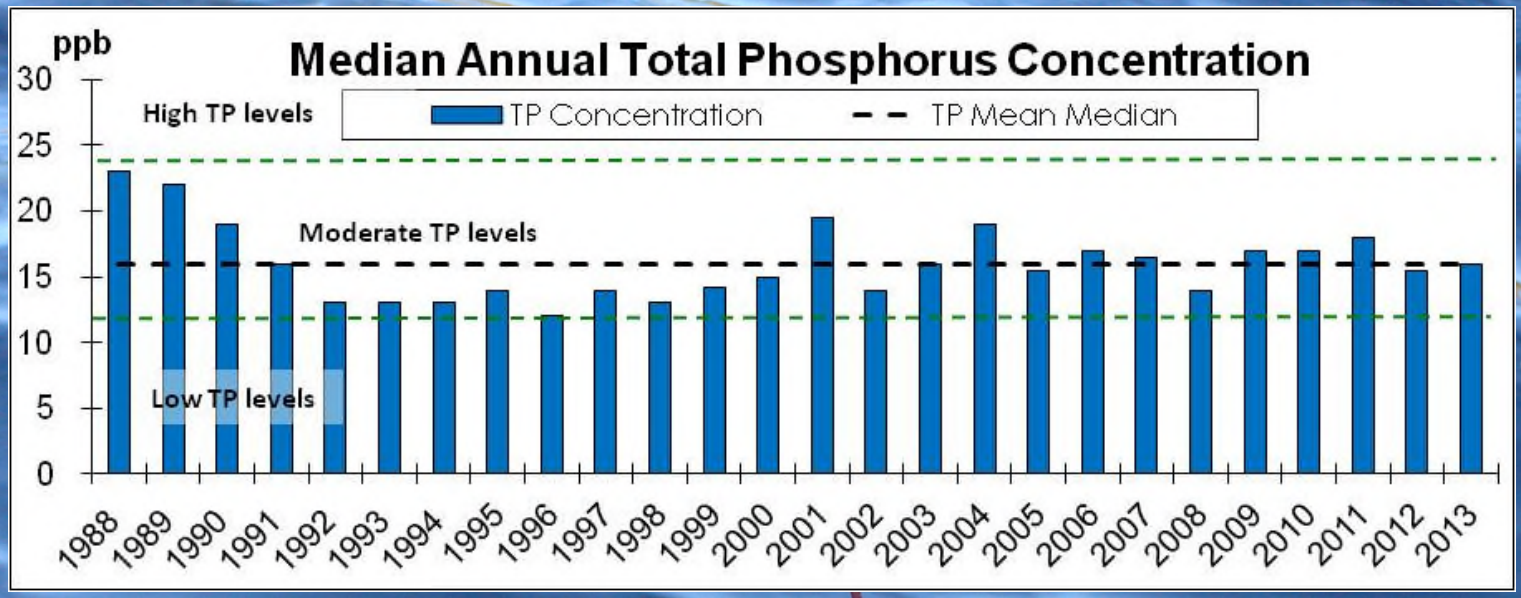

Quick Overview
DATA

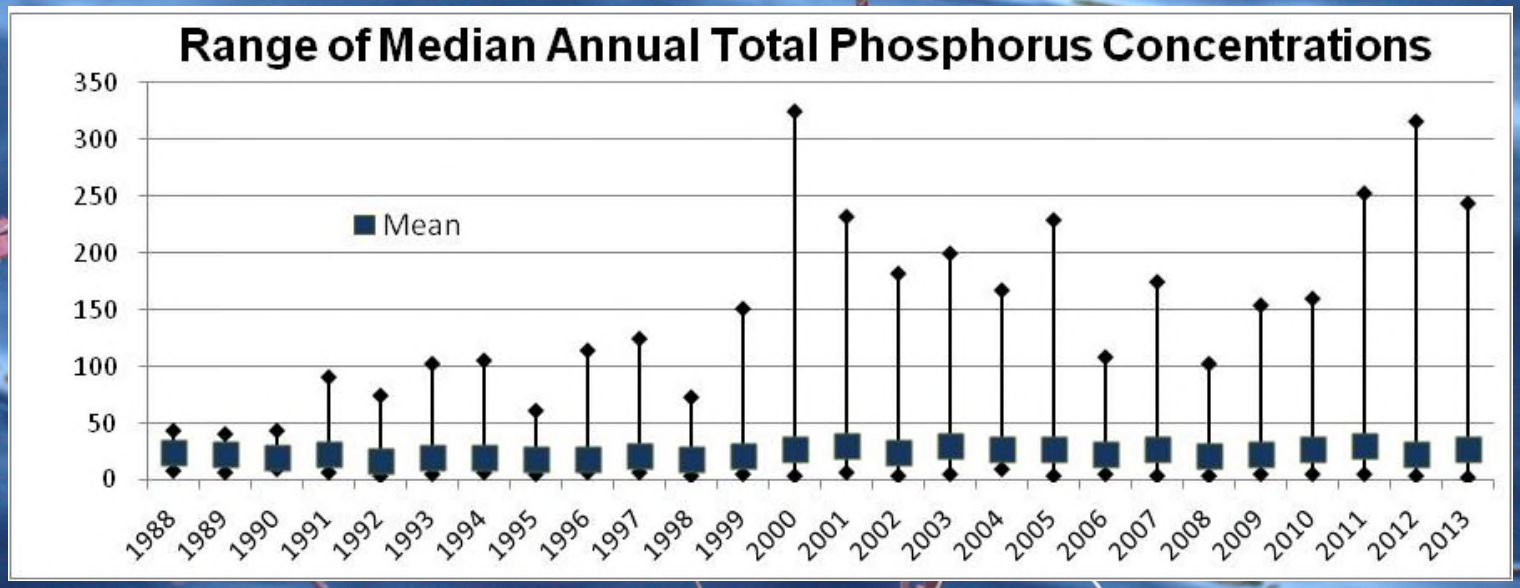
Chlorophyll - Algae



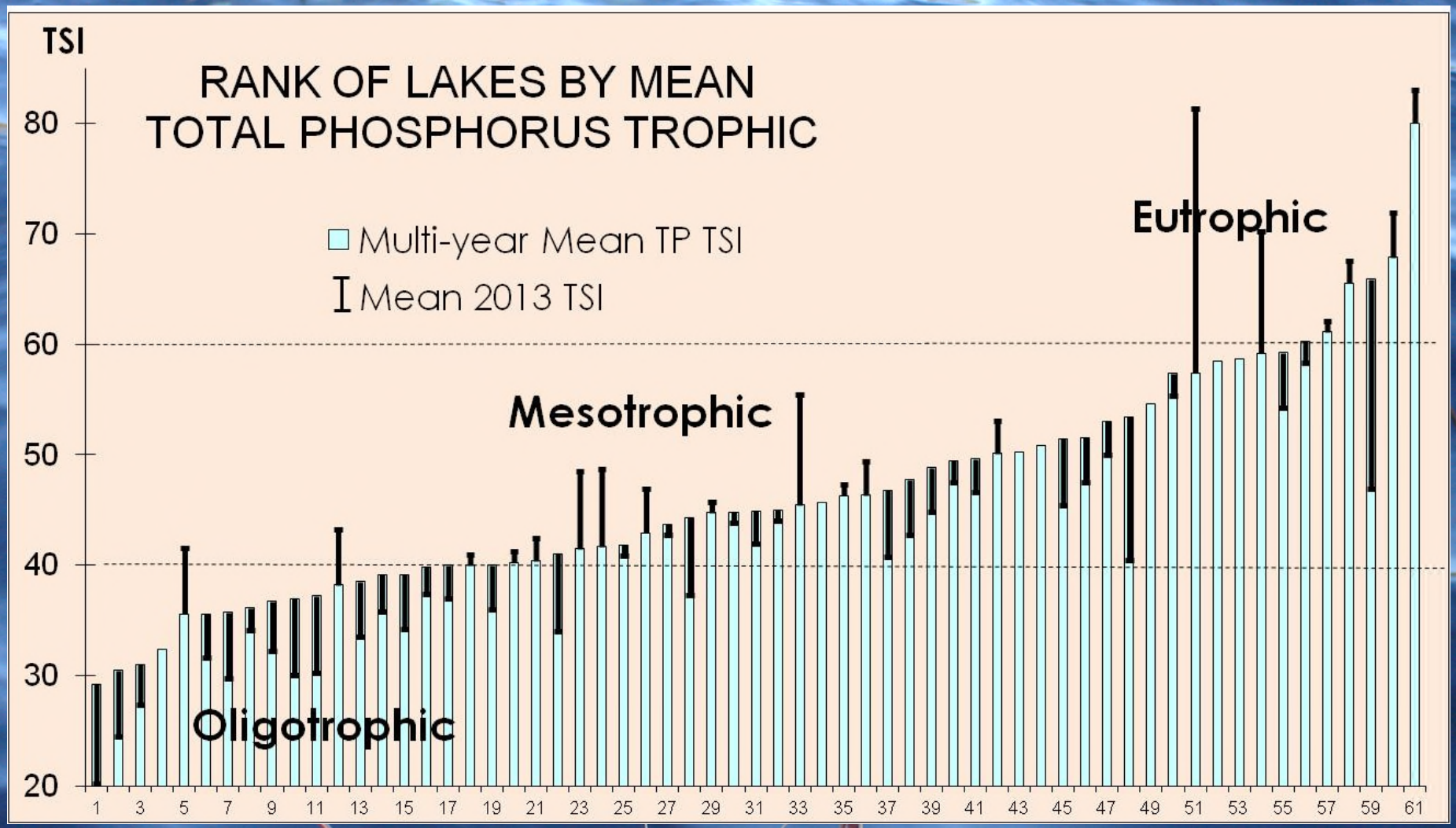


Total Phosphorus

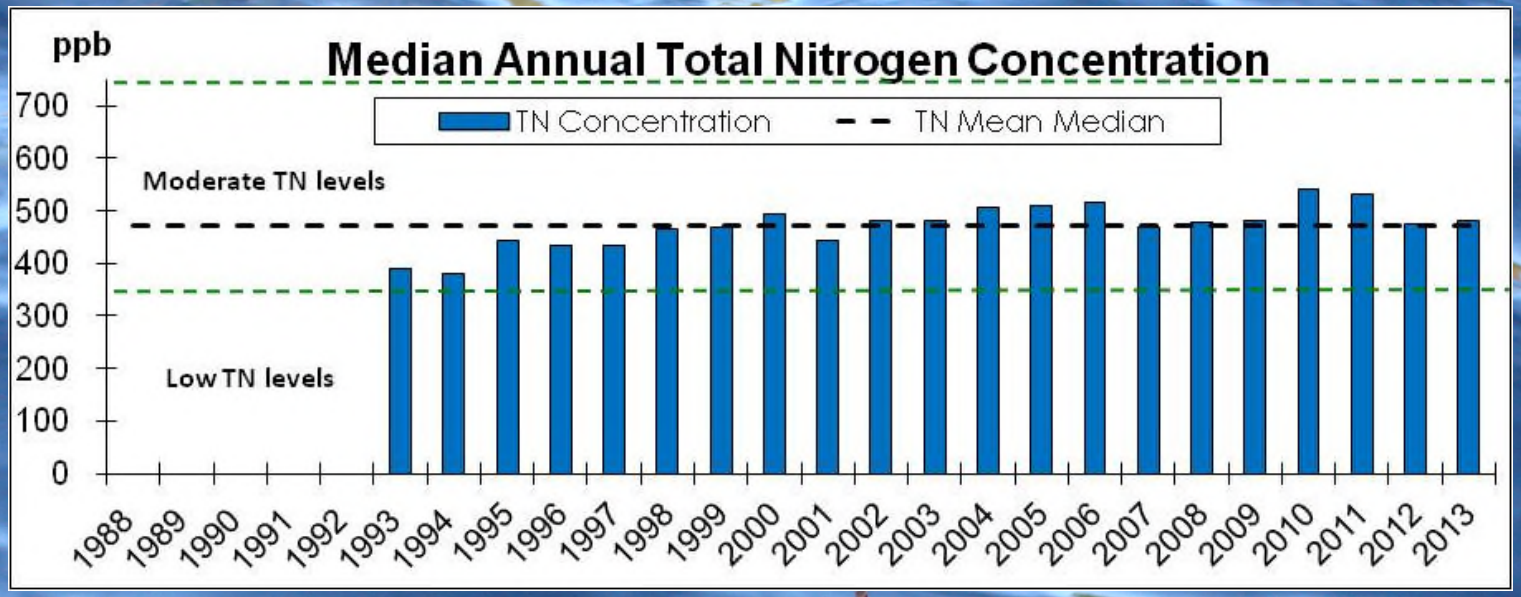


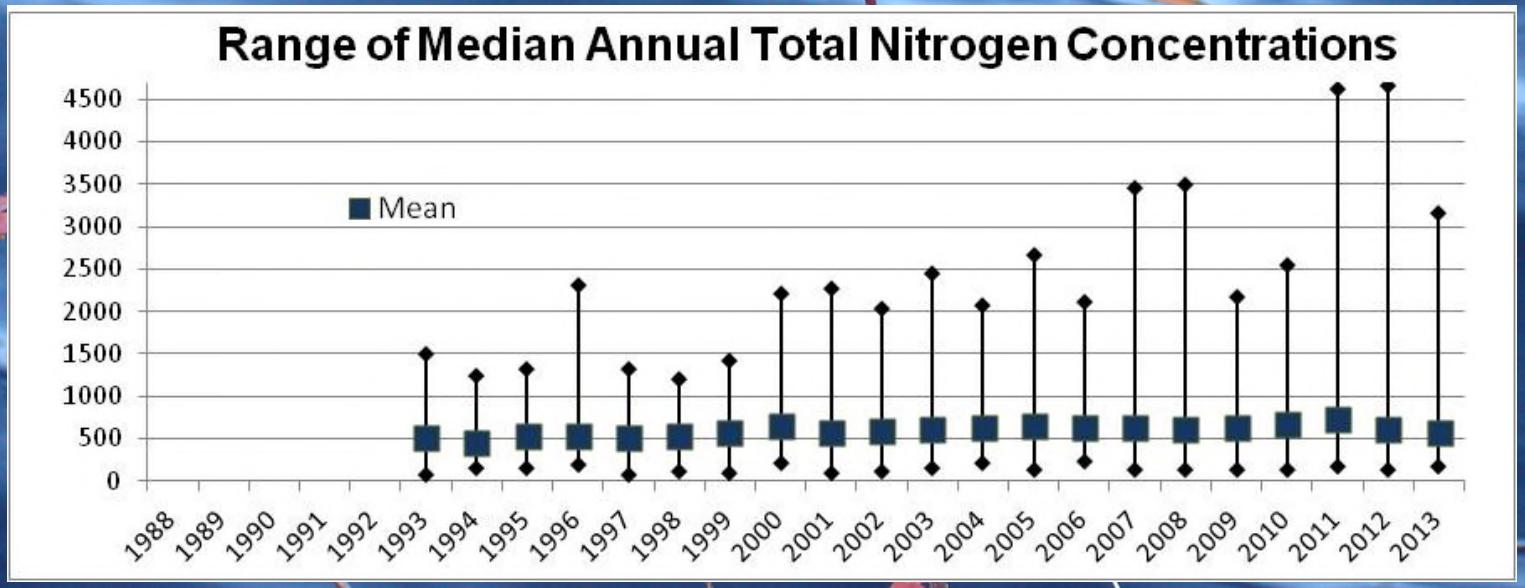


Total Phosphorus TSI

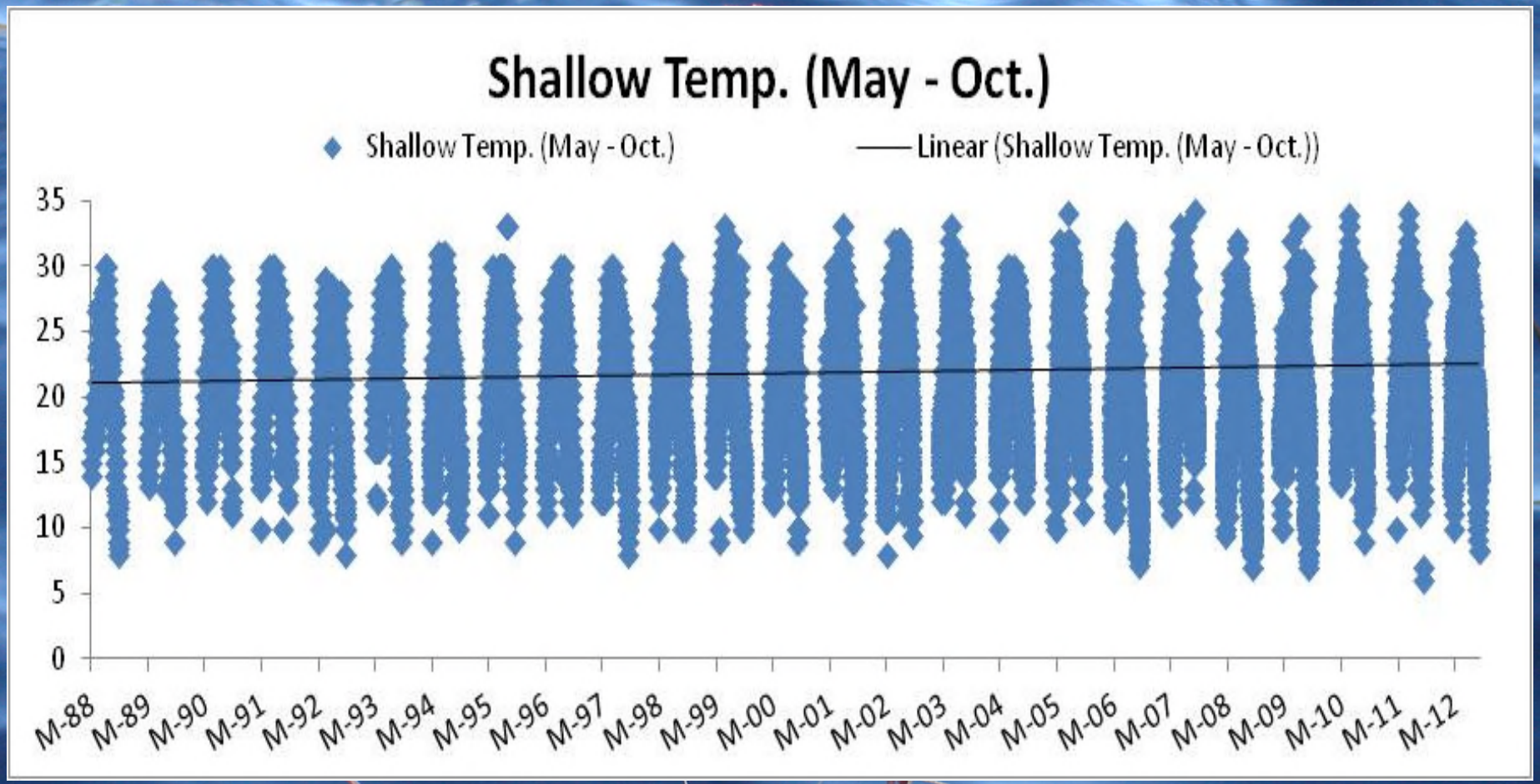


Total Nitrogen

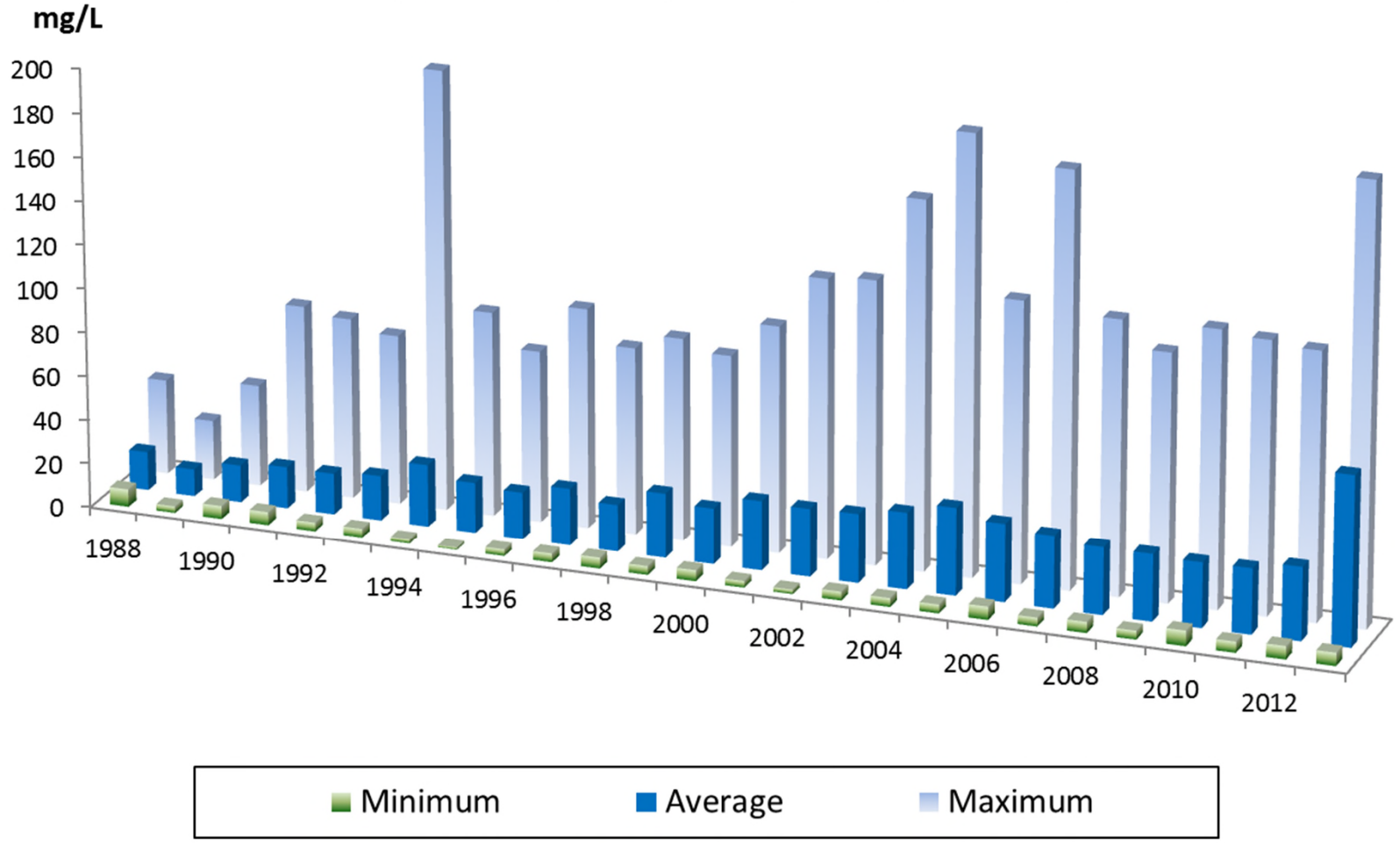




Water Temperatures



Lakes Chloride Annual Mean




URI Watershed Watch
STATE USE OF DATA

Assessment and Listing

State of Rhode Island and Providence Plantations

2010
Consolidated Assessment and Listing Methodology
For Section 305(b) and 303(d)
Integrated Water Quality Monitoring and Assessment Reporting

June 2009

Department of Environmental Management
Office of Water Resources
235 Promenade Street
Providence, RI 02908
(401) 222-3961
www.dem.ri.gov

weather, one year of data is not always considered representative of the general condition of the lake. Assessment decisions are enhanced when based on several years of data. Because the state currently obtains all lake water quality data from an agreement with the URI Watershed Watch Program (URIWW), the lake sampling index period is defined as April to November to be consistent with the URIWW's sampling schedule. Samples are collected on a monthly or twice-monthly basis depending on the parameter, during the sampling period.

For rivers and streams, a seasonal sampling index period that extends from August through September, is required for biological data. Sampling following DEM's macroinvertebrate monitoring protocol for wadeable rivers (Section 5.4.3), includes one sample per site during the sampling index period. The sampling protocol for deep, non-wadeable rivers requires 3 samples per site during the sampling index period. In accordance with the current biological (macroinvertebrate) monitoring protocol for rivers, the state's identified reference sites must also be sampled for data evaluation.

Grab samples for freshwater dissolved oxygen analyses should be collected in the early morning hours over the course of the growing season in an effort to capture the critical period for this aquatic life use indicator.

RI's saltwater DO criteria evaluates cumulative exposures of low DO with established minimum standards. Therefore RI is moving to a reliance on continuously collected saltwater DO data or data that can correlate to continuous data. Grab samples or similar DO data may still be considered if it can be correlated to continuous data or is representative of a longer time period. The new saltwater DO criteria evaluates cumulative exposures of low DO observed during May to October.

4.3.3 Sampling conditions

Currently, RIDEM will accept data collected under any sampling conditions such as low or high tide, dry or wet weather. The Department requests that the sampling conditions and other metadata about sample collection, are documented within the data report. Useful sampling condition information includes date and time of sampling, tide conditions, depth sampled, flow, date, and amount of last rainfall event. This information will be examined during the determination of usability of the data for assessment purposes.

http://www.dem.ri.gov/programs/benviron/water/quality/pdf/finlcalm.pdf

Total Daily Maximum Load (TMDL)

URIWW data are used to

- **Assess impairment**
- **Develop TMDL and community “buy-in”**
- **Monitor effectiveness upon implementation**

Roger Williams Park Pond TMDL

Why is a TMDL Needed?

Roger Williams Park Ponds is a Class B freshwater lake, and its applicable designated uses are primary and secondary contact recreation and fish and wildlife habitat (RIDEM, 2009). From 2001-2005, water samples were collected from three sampling locations (WW37, WW140, WW295) and analyzed for the indicator bacteria, fecal coliform. The water quality criteria for fecal coliform, along with bacteria sampling results from 2001-2005 and associated statistics, are presented in Table 1. The geometric mean and 90th percentile maximum was calculated for station WW37 and exceeded Rhode Island's water quality criteria for fecal coliform. Statistics were not calculated for stations WW140 and WW295 as there were insufficient data to calculate these values.

Figure 3: *Partial aerial view of the Roger Williams Park Ponds watershed. (Source: Google Maps)*

To aid in identifying possible bacteria sources, the geometric mean and 90th percentile maximum were also calculated for wet and dry weather sample days at station WW37. Both wet and dry 90th percentile values exceeded water quality standards for fecal coliform, while only the wet-weather geometric mean value exceeded the standards. Wet-weather values were much higher than dry-weather values.

Due to the elevated bacteria measurements presented in Table 1, the Roger Williams Park Ponds do not meet Rhode Island's bacteria water quality standards, is identified as impaired, and was placed on the 303(d) list (RIDEM, 2008). The Clean Water Act requires that all 303(d) listed waters undergo a TMDL assessment that describes the impairments and identifies the measures needed to restore water quality. The goal is for all waterbodies to comply with state water quality standards.

The Roger Williams Park Ponds have previously been assessed by RIDEM as not meeting water quality standards for phosphorus, excess algal growth (chlorophyll a), and dissolved oxygen. These impairments were addressed in the TMDL for Phosphorus to Address Nine Eutrophic Ponds in Rhode Island (2007).

RHODE ISLAND STATEWIDE TMDL FOR BACTERIA IMPAIRED WATERS
ROGER WILLIAMS PARK PONDS WATERSHED SUMMARY

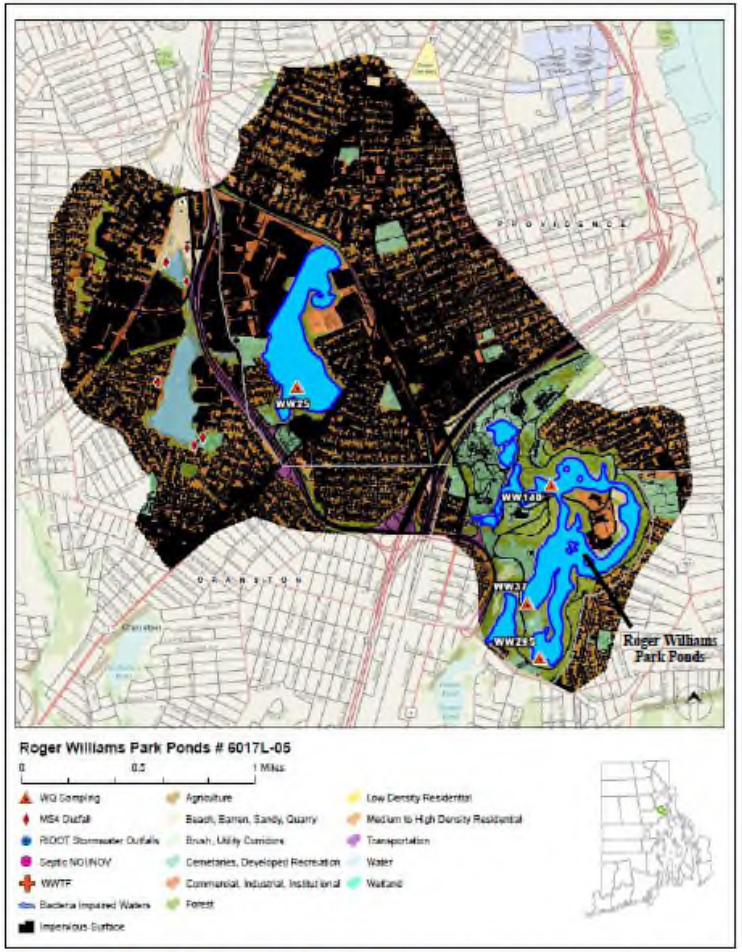


Figure 2: *Map of the Roger Williams Park Ponds watershed with impaired segments, sampling locations, and land cover indicated.*

Roger Williams Park Restoration Project Monitoring

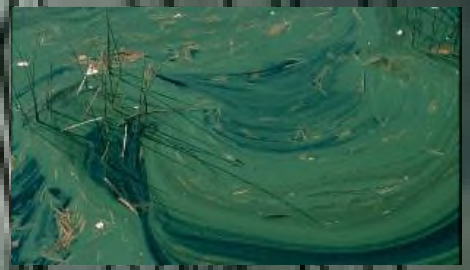
Location of monitoring station

Station Number	Lake Name	Location
Station 1	Roosevelt Lake	Inlet Pipe
Station 2	Willow Lake	Bridge Abutment
Station 3	Polo Lake	Swan Boat Dock
Station 4	Pleasure Lake	Northwest side of bridge abutment
Station 5	Edgewood Lake North	From Bridge with Deep Sampler
Station 6	Edgewood Lake South	Middle - deep spot
Station 7	Cunliff Lake	Middle - deep spot
Station 8	Elm Lake	Middle - deep spot
Station 9	Elm Lake	Outlet

Nutrient Criteria

- URIWW data included in the USEPA nutrient criteria development
- State criteria:
  - Lakes and ponds nutrient criteria being developed based mostly on URIWW data
  - Rivers and stream next – URIWW data will be used in that process too.

Cyanobacteria



NOTICE OF PUBLIC MEETING

Property Owners, Residents, Fishermen, Farmers & Recreational Users of the Shickasheen Brook from Route 3 through and including Yawgoo Pond, Barber's Pond and all the way to the Pawcatuck River.

WARNING

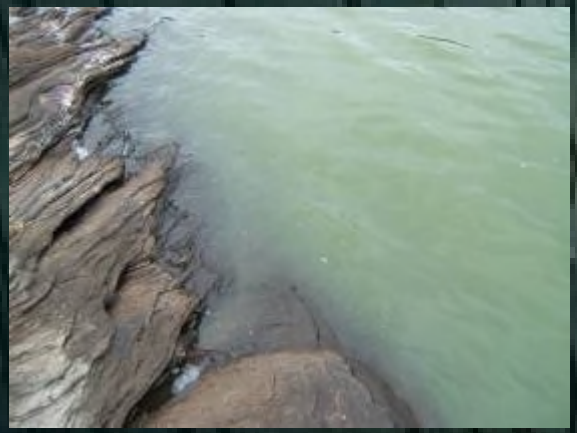
The Shickasheen Watershed is being contaminated by algae blooms dangerous to animals & human life.

We need your help. . . town, state & federal officials will be present to respond. PLEASE ATTEND THIS IMPORTANT MEETING!!

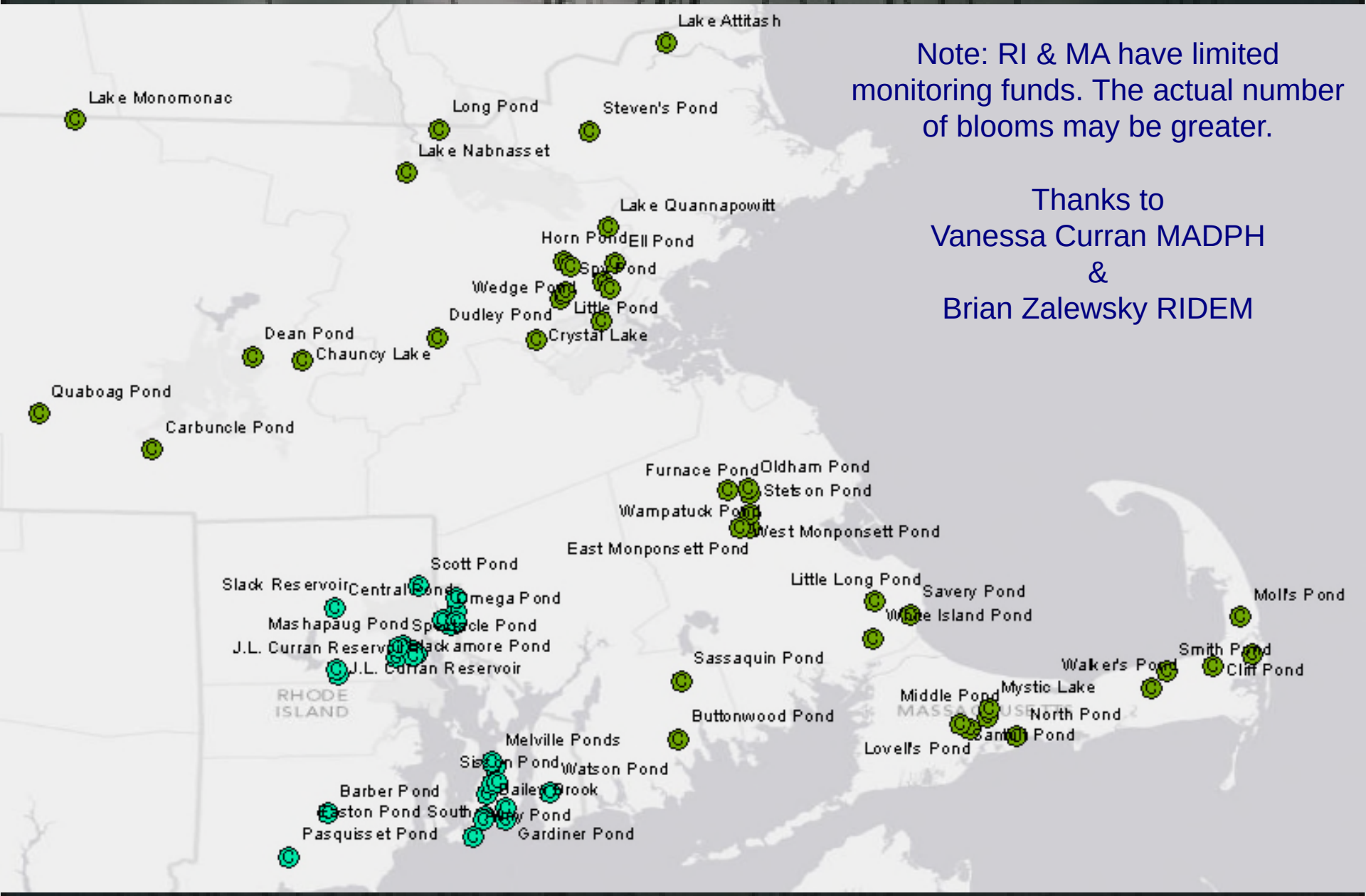
Tues., Oct. 2nd • 7:30 p.m.
White Memorial Auditorium
University of Rhode Island Campus

From the Main Entrance of Upper College Road
Follow arrows to Flagg Road then left to White Auditorium

Yawgoo Pond Association • P.O. Box 66 • Kingston 02881



RI & MA Cyanobacteria Advisories 2010-2012



Note: RI & MA have limited monitoring funds. The actual number of blooms may be greater.

Thanks to
Vanessa Curran MADPH
&
Brian Zalewsky RIDEM

WatershedCounts20121203.mxd Source: RIDEM & MADPH


Other Ways
URIWW DATA INFORMS

Bristol Harbor Predictive Habitat Model

Figure 6. Map showing locations of the tilt current meters (TCMs) deployed in Bristol Harbor during August, 2011. TCMs at stations BH01-04 lie within northernmost Bristol Harbor. Stations BH05 and BH06 lie on eastern and western sides of the middle portion of Bristol Harbor. Stations BH07-09 are spaced along the mouth of Bristol Harbor. BH11 and BH12 lie within the western and eastern entrances to the Bristol Harbor sub-system, respectively. A final TCM (BH10) was placed in the restricted zone, east of Walker Island. The locations of temperature sensors placed in the bases of the specific TCMs are shown with magenta circles.

CLEAN WATER PROJECTS

- Predictive Habitat Model
- Water Sampling Program

Predictive Habitat Model

Click here for figures showing results of the Predictive Habitat Mod

As part of its mission, Save Bristol Harbor seeks to gain a better understanding of the Bristol Harbor habitat inc chemical and physical characteristics. The Predictive Habitat Model (PHM) provides a means to this end. The of the model is to predict the impact and movement of contamination after it enters the waterway; it may also p on water circulation from the addition of a significant barrier or structure constructed within the harbor. The mod tidal and wind effects.

This is the first project focused on generating a comprehensive, multidimensional habitat model of Bristol Harbo Silver Creek, Tanyard Brook and Mill Gut waterways. It helps inform us how the harbor functions and can be us informed, objective and environmentally-informed growth and redevelopment decisions about the Bristol Harbor among others, the Town of Bristol and the Harbor Commission.

Why Now?

As the Bristol population grows and its landscapes change, the Town continues to make decisions that affect t Harbor and surrounding waters without full knowledge of the total impact of these decisions on the Harbor habit decisions about future use of the local waters for private and commercial enterprises, coupled with demands fr

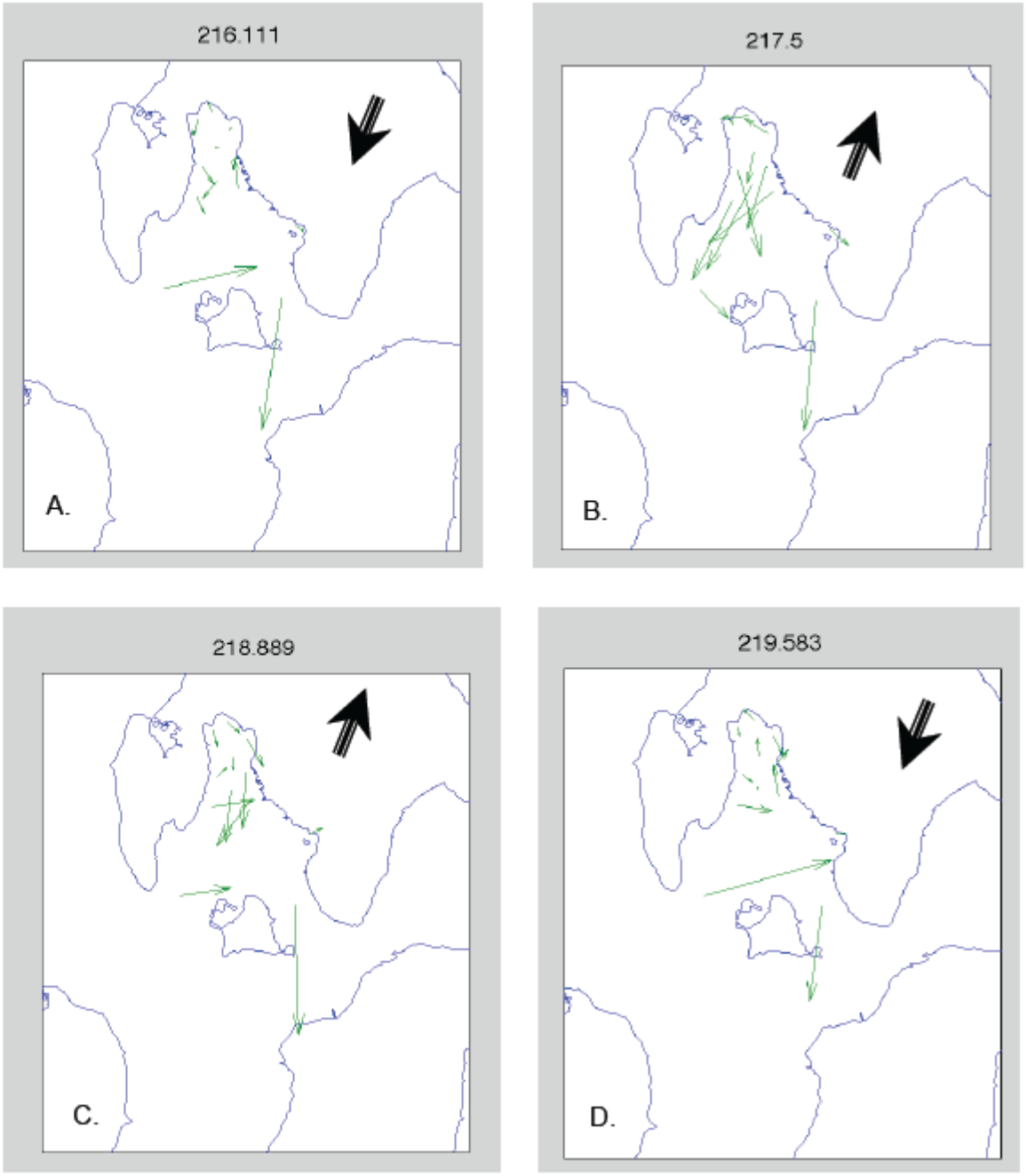


Figure 23. Mapview plots showing Bristol Harbor. At each TCM location is a near-bottom residual water-flow vector (tide averaged out) for specific times in 2011. The decimal day for each flow vector map is shown on the plot. A number of repeatable circulation patterns are seen over the deployment. A. A strong clockwise gyre around Hog Island. Counterclockwise flow in central harbor. Weak flushing from upper harbor. B. Strong central flushing event. Isolated upper harbor. C. Strong whole harbor flushing, with Hog Island gyre. D. Separated gyres around Hog Island and in central harbor.

Invasive Species

- Calcium / alkalinity levels to help assess susceptibility to zebra mussels
- Nutrient, pH and alkalinity used to identify lakes of concern for the spread of variable leaf milfoil
- Volunteers also frequently first to report pioneer infestation – whether trained “weed watchers” or not

Volunteer Monitoring:

University of Rhode Island Watershed Watch
(URIWW) Invasive Aquatic Plant Survey Manual

Available at
www.uri.edu/ce/wq/ww/PlantProtocol.pdf

- Bas
- Up
  lea
- Inc
  ma

Pre and Post Treatment Monitoring

- Volunteers often provide essential pH, dissolved oxygen, water clarity and nutrient data both before and after aquatic herbicide and other in-lake treatments
- Usually provide the ONLY long-term post treatment monitoring

Elevated Mercury

- USEPA lab analyzing fish tissue mercury levels used volunteer data to begin determining why similar atmospheric deposition resulted in different mercury levels in various lakes
- Preliminary data suggests pH, chloride Secchi depth explained 65% of the variation

USEPA Database

Web www.epa.gov/aed/html/wildlife/index.html

Search with Google

AED Home
Basic Information
Organization
Research Programs
Scientific Communications
Opportunities at AED
Procurement Opportunities
Greening Our Lab
Community Outreach
Collaboration
A to Z Index

EPA United States Environmental Protection Agency

Wildlife Database Search Engine

This screen is designed to access wildlife data. Select list options and then press the Search button. Press the Help button for more directions.

Data Sources:
- University of Rhode Island Watershed Watch
- Vermont Department of Environmental Conservation
- Wisconsin Department of Natural Resources

Countries:
- Canada
- USA

Lakes:
- Schoodic Lake (Maine)
- School House Pond (Rhode Island)
- School Pond (New Hampshire)
- Schoolhouse Pond (Massachusetts)
- Schoolhouse Pond (Rhode Island)
- Schoolhouse Pond - Merrill (Massachusetts)

States/ Provinces:
- New Jersey
- New York
- Nova Scotia
- Rhode Island
- Vermont
- Wisconsin

Years:
- 1925
- 1940
- 1942
- 1952
- 1953

Search | Reset | Help

National Health and Ecological Effects Research Laboratory
Atlantic Ecology Division
27 Tarzwell Drive
Narragansett, RI 02882

TION AGENCY

Share

rous Bird

eNTtS for the New DATABASE. The

Take Home Messages

- Long-term commitment and institutional support can produce valuable results!
- Volunteer monitoring data fills gaps, builds local knowledge and stewardship
- Long-term data often finds unexpected uses
- The year you decide to “skip” is always the year that something BIG happens and you really wish you had those data …

- ???